

May (C. H.)

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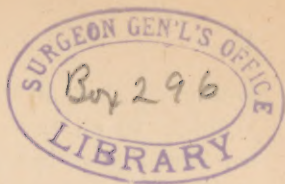


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## TRANSPLANTATION OF A RABBIT'S EYE INTO THE HUMAN ORBIT.

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I N the *Medical Record* of May 29, 1886, I reported a series of experiments, consisting of the transplantation of the eyes of rabbits. Previous to an account of the operation upon the human being, it may be of interest to give an abstract of the contents of the paper just alluded to:

Twenty-four rabbits were used in the experiments; in eighteen of these, the cornea either sloughed or became sclerosed and shrivelled so that the operation was considered a failure. In six, however, very favorable results were obtained. The failures in the first eighteen cases were attributed to imperfect technique and inability to keep the eyes properly bandaged. In the six successful cases, these difficulties were overcome, and gratifying results ensued; the transplanted organs became attached and preserved their vitality. Blood-vessels could be seen to pass from the orbital conjunctiva to the transplanted globe as early as the fifth day; muscles seemed to form some attachment as early as the third or fourth day. The favorable cases were watched for ten weeks, and at the end of that time the following had taken place: The transplanted organ had preserved its shape and consistence, though it had become a trifle smaller; vascularity was good; muscular action in all directions perfect; the cornea, which immediately after the operations had become opaque, had cleared consid-

erably, so that, although still hazy, the iris was distinctly visible. In all the cases there was neither implication of the healthy eye in any way, nor interference with the general health of the animals, so far as could be ascertained by the temperature and other means.

These favorable results upon rabbits' eyes led me to believe the operation a feasible one in man, notwithstanding that five cases had been reported, all of which were failures. The first case was that of M. Chibret (*Revue Générale d'Ophthalmologie*, May 31, 1885); the second that of M. Terrier; the third that of M. Rohmer; the fourth that of Dr. H. W. Bradford (*Boston Medical and Surgical Journal*, September 17, 1885)—I classify this case as among the failures, notwithstanding that it is reported as a success after eighteen days' observation, since this is the general belief among ophthalmologists, and since no answer was obtained to the writer's letter to the gentleman asking for further information about his case; also because the statement in the writer's report of these experiments doubting the success of Dr. Bradford's case has never been challenged. The fifth case is reported by M. Terrier, October 19, 1885. The results, therefore, were not promising as far as the transplantation of the eyes of rabbits into the orbit of the human being was concerned; my hope of being more successful than previous operators was based upon perfected technique and extensive experience with the operation upon the twenty-four cases alluded to. It seemed reasonable to infer, that if success had attended the last six of the series of experiments in rabbits, in whom the transplanted organ could not be kept absolutely quiet, and who were difficult subjects in other ways, that at least equally favorable results could be hoped for in man, where the patient would himself aid in the chances of the procedure by absolute rest to the organ, cleanliness, and local applications of heat and moisture to facilitate and hasten the process of union between the attached surfaces.

Not long after I received a communication from Mr. W., the editor of a prominent Western paper, in which he inquired whether I would be willing to perform the operation



upon him; he had lost the sight in one eye, and had been advised to have it removed so as to avoid implication of the fellow; he described himself as of good physique, of good habits, indulging considerably in athletic sports, and as being desirous of having the experiment tried upon him without any other promise as to results than that even though the experiment failed there would still be sufficient tissue remaining to form a serviceable stump for an artificial eye. This assurance I gave him, and, coming on to New York, he furnished the basis for the following report:

Mr. C. A. W., æt. twenty-nine. Seventeen years ago right eye was injured by an explosion on the 4th of July, a piece of metal perforating the upper lid and injuring the eyeball, but not lodging in it; severe inflammation followed for four weeks, then subsided, leaving the eye completely blind. The blind eye has never troubled him; the sound eye, after wearing a glass which corrected his astigmatism, never gave him much trouble. He wishes the right eye removed because it is unsightly, and because oculists at his home have told him it ought to be removed on account of a possible future effect upon the sound eye.

Present condition:

O. S. V.  $\frac{2}{3}$ : Hypermetropic astigmatism corrected by  $\frac{1}{4}$ s  $\frac{1}{10}$  cyl. ax.  $90^{\circ}$ . Ophthalmoscopic examination negative. No ciliary tenderness. Lids normal. Conjunctiva normal.

O. D.: No perception of light. Cornea thinned, opaque, and staphalomatous. No ciliary tenderness. T. + 1. Eyeball slightly smaller than fellow. Conjunctiva normal. Upper lid presents double scar. Movement of eyeball good.

Operation Feb. 1, 1887.

A very large-sized brown buck of the kind known as the Belgian hare, having brown eyes (matching as nearly as possible, though a shade darker than those of the patient), was etherized; the conjunctiva separated at one eighth of an inch from the margin of the cornea all around, and the muscles and sub-conjunctival tissue severed, leaving as much areolar tissue upon the eyeball as was possible; the optic nerve was not divided at this stage, but the eyeball was covered by the lids and attention now directed to the patient. The latter having been anæsthetized in the meanwhile, the conjunctiva was separated from the globe as

close to the cornea as possible, a loop of thread was passed through each of the recti muscles with the overlying conjunctiva, and after these muscles had been thus secured, they were cut; the areolar tissue was loosened, keeping as close to the eyeball as possible, so as to leave as much tissue in the sac as could be left; the optic nerve was cut off close to the globe. The stump of the nerve was sought for with the finger, felt, and a single thread of fine catgut passed through it with a needle and forceps specially designed for the operation. These forceps consist of ordinary fixation forceps, with their lower extremity widened and curved, concavity inward, so that when the ends are approximated they represent a circle, the diameter of which is  $3\frac{1}{2}$  mm, and the edges were slightly rough; the sides of the lower expanded extremity present small openings. The special needle consists of a lance-shaped, pointed, curved needle, the eye being situated very near the point, mounted upon a handle.

The optic nerve having been seized with the forceps, the needle, threaded with fine catgut, was passed through the lateral openings of the forceps and thus through the optic nerve; the suture was caught up from the end of the needle after having traversed the nerve, the needle withdrawn, and the forceps removed; in this way the suture had been passed through the end of the optic nerve with a minimum amount of laceration and without loss of time. Attention was now given to the rabbit's eye, the enucleation of which was completed by cutting the optic nerve, dividing it as far back as was possible, and leaving upon the globe as much areolar tissue as was present.

The suture through the patient's stump was now passed through the optic nerve remaining upon the rabbit's eyeball, and the ends of the two optic nerves were thus approximated and secured by an ordinary knot. The conjunctival sac was then stitched to the rim of conjunctiva remaining upon the rabbit's eye, ten sutures being employed; those inserted opposite muscles included the anterior extremities of these and thus fastened them to the globe. During all this time, the rabbit's globe remained perfectly clear. During the operation saturated solution of boric acid was used freely upon the eye of the patient; no fluid of any kind was applied to the eye of the rabbit, previous experiments having led me to believe that the use of boric acid and of corrosive sublimate had hastened the clouding of the cornea. The eye being freed from blood, the lids were approximated, white vaseline and cot-



ton applied ; both eyes were bandaged, pressure upon the transplanted organ being avoided. Hot compresses were ordered ; these consisted of four-ply pieces of linen wrung out of hot water ; they were applied over the bandage, and supported upon a wire frame so arranged as to avoid pressing upon the eyeball, by resting upon the margins of the orbit.

Feb. 2d. Second day.—Eye felt slightly sore, but no great pain. Removed dressings at the end of twenty-four hours ; considerable chemosis and marked œdema of upper lid ; cornea smooth, nebulous, but iris distinctly visible ; cornea insensitive ; there was a moderate amount of sero-purulent discharge mixed with blood. Rebandaged both eyes, and hot applications continued day and night.

Feb. 3d. Third day.—Cornea more hazy, iris being almost indistinguishable ; considerable sero-purulent discharge.

Feb. 4th. Fourth day.—(Edema of upper eyelid and chemosis are still considerable ; conjunctiva is very much reddened and angry-looking. Cornea is almost opaque, so that iris can scarcely be distinguished ; it is smooth, has preserved its form, and is insensitive ; the movement of the transplanted organ is good (due to stitches) ; patient has remained quiet upon the back, urine and fæces being discharged in the recumbent posture ; he feels comfortable, and pulse, respiration, and temperature have remained normal ; both eyes are still kept bandaged, and the sound eye appears normal.

Feb. 5th. Fifth day.—Patient allowed to sit up an hour in bed. Less œdema of upper lid and less chemosis, though conjunctiva is still very much reddened, and at junction with the transplanted organ a number of small granulations are seen ; hot applications are now made for one hour every three hours.

Feb. 6th. Sixth day.—Discharges are sweet, moderate in amount, and sero-purulent in character ; some of the stitches were removed ; others still in place. Granulation tissue still visible.

Feb. 8th. Eighth day.—Everything had progressed favorably thus far. The cornea was smooth, insensitive, opaque ; movement of the eyeball excellent ; size the same as on insertion ; the sound eye and the general health of the patient had not suffered in the least. Upon removing the dressings to-day, the presence of pigment from the iris shows that an opening in anterior chamber must exist ; on examination, no opening can be found, but the lower part of the cornea looks suspicious at one point. Form of eyeball still preserved. Rebandaged.

Feb. 9th. Ninth day.—Upon removing dressings, more pigment of iris was found to have escaped. Examination shows a small ulceration at lower edge of cornea with perforation. The patient said the eye had felt "soft" during the night. Discharge moderate and sero-purulent. The experiment was considered at an end, for although patient was willing to submit to another transplantation, this was not considered justifiable.

The rabbit's eye was removed under cocaine anæsthesia and the operation was quite painful, notwithstanding the free use of the local anæsthetic. A few of the sutures were still in place; the steps of the secondary operation were those of an ordinary enucleation. The muscles were found to have become attached, but the connection was not very firm and could be severed with the hook; here and there the scissors had to be used; the optic nerve was found to have united by loose connective tissue and had to be cut again. After enucleation, the rabbit's eye was found to have preserved its form, was slightly smaller than on insertion, the cornea opaque, considerably thickened, and presenting the perforation already alluded to; lens opaque; vitreous of a boiled-starch appearance. The conjunctival sac was found to be lined by numerous collections of granulation tissue, and swollen and stiffened so that on withdrawing the eyeball the sac did not collapse, but presented the appearance of a hollow globe with a central deep cavity corresponding in size and form to the removed eyeball. The cavity was scraped and the margins of the sac approximated by sutures.

Feb. 21st.—Since last note there has been considerable discharge of a muco-purulent nature from the stump, and the hardness and swelling have gradually disappeared, so that now it presents the appearances of an ordinary stump several days after an enucleation, and is ready for an artificial eye; it is of good size and possesses excellent motility.

In reporting this case I do so with the hope that it may be regarded as a fair test-case; although it is true that one case does not prove much, yet this one is entitled to special consideration in this respect—the patient has had every possible chance of success. Of good physique, with good care and nursing, and with extraordinary patience, he made a capital subject for the experiment; then again I had flattered myself that the technique could not have been



much improved; I had sufficient experience with the operation both during the experiments upon rabbits and upon the cadaver, so that there was no hitch in the proceeding; were I to do the operation over again I do not know how I could change or improve any of the details—and yet it was a failure! So that I have changed from an enthusiast to a disbeliever in the operation. I do not believe it a feasible one in man, and would not be willing to undertake it again. While smaller portions of tissue may be transplanted with success, the whole eyeball presents too great a mass to have its vitality preserved and make even a fair substitute for the artificial eye.

In conclusion, I wish to express my obligations to Dr. E. Gruening for valuable assistance and suggestions during the operation; it is a satisfaction to know that this gentleman agrees with me in the assertion that the case is entitled to be considered as of value as a good test-case, in which the operation had every possible chance of success, but yet failed.









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